



## ***Opistognathus ensiferus*, a new species of jawfish (Opistognathidae) from the Gulf of Mannar, India, with redescription of *O. solorensis* Bleeker**

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### **Abstract**

A new species of jawfish, *Opistognathus ensiferus* **n. sp.**, is described based on a single specimen from Manauli Reef in the Gulf of Mannar, India. It is a member of a species group that also includes *Opistognathus solorensis* Bleeker (Indonesia, Philippines, Taiwan and Palau) and *O. verecundus* Smith-Vaniz (northwestern Australia). From these two species *O. ensiferus* **n. sp.** differs in lacking dark oral pigmentation, except inner lining of upper jaw and adjacent membranes with a single dark stripe (vs. two stripes) and in having a lateral line ending below the 6th or 7th segmented dorsal-fin ray (vs. below the 1st to 4th ray). *Opistognathus solorensis* is redescribed and in the absence of extant type specimens a neotype is designated. Two strikingly different color morphs are documented for *O. solorensis*, including the less common one which is almost entirely yellow.

**Key words:** Opistognathidae, jawfish, *Opistognathus ensiferus* new species, India

### **Introduction**

The family Opistognathidae includes approximately 60 Indo-West Pacific species of *Opistognathus* Cuvier 1816, many still without scientific names. In a paper describing new species of Australian jawfishes, Smith-Vaniz (2004) stated that *Opistognathus verecundus* Smith-Vaniz 2004 was closely related to *O. solorensis* Bleeker 1853, but except for a brief comparison no description of the latter species was provided. A third species of *Opistognathus*, collected in 1964 and known from a single specimen from the Gulf of Mannar, India, represents the third member of the *O. solorensis* species group. The purpose of this paper is to fully describe this new Indian Ocean jawfish and the allopatric *Opistognathus solorensis*.

The *Opistognathus solorensis* species group shares the following combination of characters: upper jaws with a flexible lamina posteriorly; maxilla widest before end and sword-shaped in adult males; supramaxilla relatively narrow and elongate; dorsal and anal fins typically XI, 14 and III, 14, respectively; adults with all segmented dorsal- and anal-fin rays branched distally; vertebrae 10+18; no vomerine teeth; and body with 44–69 oblique scale rows.

In addition to the three members of the *Opistognathus solorensis* species group, eight other Indo-West Pacific jawfishes are characterized by having upper jaws with a flexible lamina posteriorly: *O. nigromarginatus* Rüppell, 1830, *O. castelnaui* Bleeker, 1860, *O. muscatensis* Boulenger, 1887, *O. iyonis* (Jordan and Thompson, 1913), *O. randalli* Smith-Vaniz, 2009, *O. variabilis* Smith-Vaniz, 2009, *O. adelus* Smith-Vaniz, 2010 and *O. albicaudatus* Smith-Vaniz 2011. All of these species have color patterns that are very different from *O. ensiferus* **n. sp.** and *O. solorensis*, and typically have more oblique longitudinal scale rows 68–110 (except *O. adelus* with 40 or 41 and *O. iyonis* with about 45 scale rows). The two exceptional species also differ in having the end of upper jaw broadly rounded and the supramaxilla relatively large and oval-shaped. *Opistognathus iyonis*, known only from Japan and Korea, further differs from the others in having only two anal-fin spines. Descriptions and illustrations of all these species, except *O. iyonis*, are given in Smith-Vaniz (2009, 2010, 2011).

## Materials and methods

Methods follow Smith-Vaniz (2009). Abbreviations used for institutional depositories are as follows: Australian Museum Sydney (AMS); Academy of Natural Sciences of Drexel University, Philadelphia (ANSP); Bernice P. Bishop Museum, Honolulu (BPBM); Field Museum of Natural History, Chicago (FMNH); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Royal Ontario Museum, Toronto (ROM); South African Institute of Aquatic Biodiversity, Grahamstown (SAIAB); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); Western Australian Museum, Perth (WAM).

### *Opistognathus ensiferus* new species

(Figures 1–2A; Tables 1–4)

**Holotype.** (only known specimen) FMNH 71365, 61.5 mm SL, male, India, Gulf of Mannar, Manauli Reef, Musal Tivu Island (Hare Island), 9°12'N, 79°55'E, ca. 1.0 m, living and dead coral, sand and rubble, Loren P. Woods, 22 February 1964.

**Diagnosis.** A species of *Opistognathus* with an elongate supramaxilla and maxilla with flexible lamina posteriorly, widest before end and sword-shaped in adult males; inner lining of upper jaw and adjacent membranes with a single black stripe and no dark oral pigmentation; dorsal and anal fins XI,14 and III,14, respectively; lateral-line terminus ends below dorsal-fin segmented rays 6 or 7.

**Description.** Dorsal-fin rays XI,14. Anal-fin rays III,14. Pectoral-fin rays 20. Caudal fin: procurent rays 5+4, segmented rays 8+8, middle 14 branched, total elements 25; hypural 5 present. Vertebrae: 10+18; last rib on vertebra 10; epineurals 13. Supraneural bones 1. Gill rakers (right/left) 9/10+18/19 = 27/29.

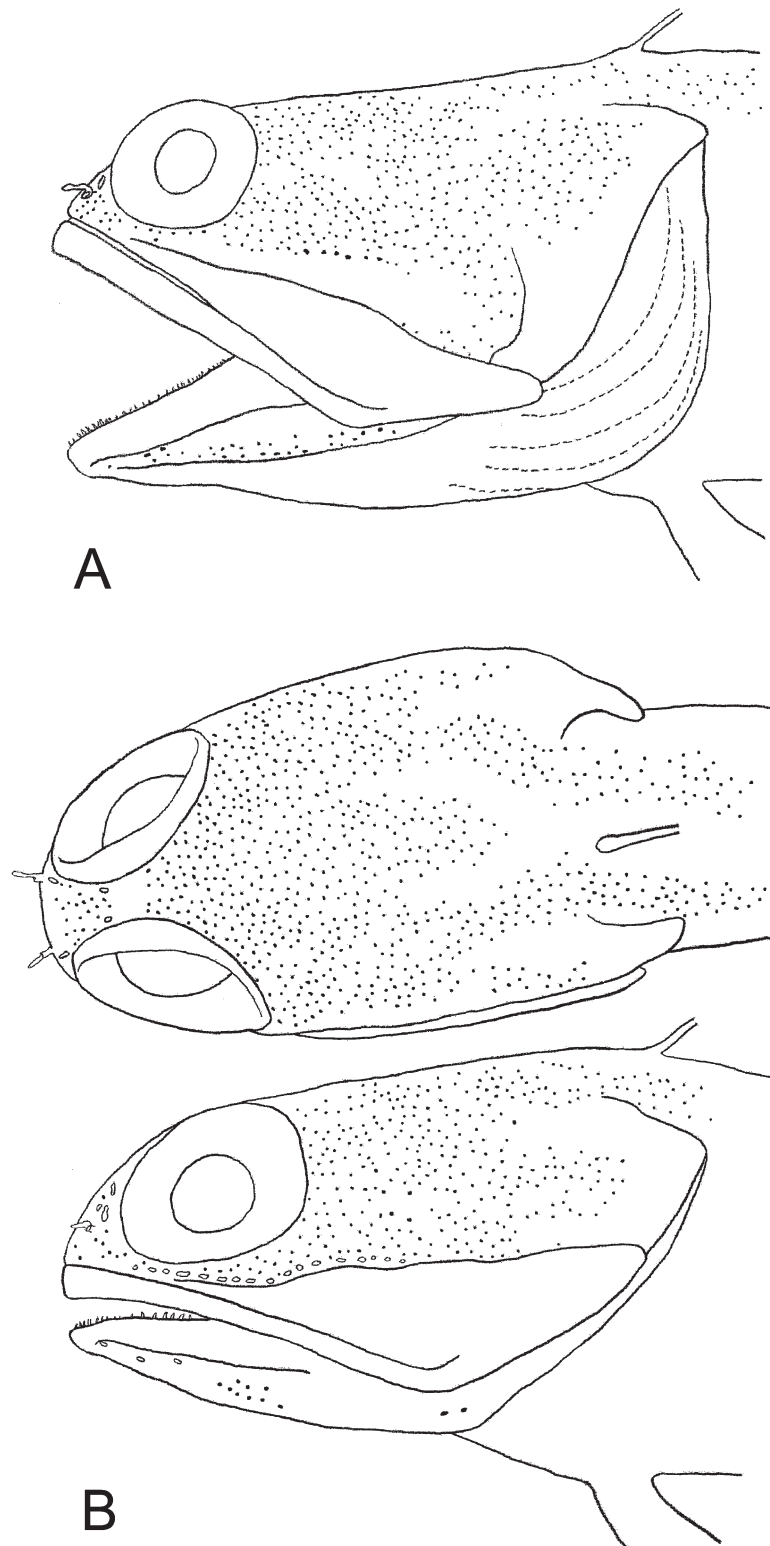
Scales absent on head, nape, area above lateral line, pectoral-fin base and breast; belly completely scaly. Body with about 48–52 oblique longitudinal scale rows. Lateral line ends below verticals from 6th (left) or 7th (right) segmented dorsal-fin rays. Lateral line pores numerous, arranged in multiple series above and below embedded lateral-line tubes. Cephalic sensory pores numerous, completely covering most of head, including all of predorsal area except a small area immediately adjacent to dorsal-fin origin (Fig. 2A); mandibular pore positions 1–2 occupied by relatively large, single pores, 3rd position with 5 or 6 pores, 4th with 8 pores, and 5th position with at least 15 pores.



**FIGURE 1.** *Opistognathus ensiferus* n. sp., holotype, FMNH 71365, male, 61.5 mm SL, India, Gulf of Mannar, Manauli Reef. Drawn by Jack R. Schroeder.

Anterior nostril slightly closer to posterior nostril than to dorsal margin of upper lip, and with a simple, flattened tentacle on posterior rim that when depressed reaches margin of posterior nostril; height of tentacle about 1.5 times maximum of diameter of posterior nostril. Dorsal fin moderately low anteriorly, gradually increasing in height posteriorly; profile relatively uniform with only a slight change in fin height at junction of spinous and segmented rays. Dorsal-fin spines relatively slender and curved distally with flexible tips; all segmented dorsal-

and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradi al membrane incised distally. Posterior margin of preopercle indistinct without a free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 $\beta$  branch of adductor mandibulae.



**FIGURE 2.** Cephalic sensory pores in two species of *Opistognathus*: A, *O. ensiferus* n. sp., holotype and B, *O. solorensis*, WAM P.33117-001, male, 48 mm SL, Brunei.

Upper jaw extends 2.2 eye diameters behind posterior margin of orbit; maxilla with flexible lamina posteriorly, widest before end and sword-shaped in adult males; supramaxilla moderately large, elongate and subterminally positioned. Premaxilla with an outer row of stout conical teeth that become progressively smaller posteriorly, an inner row of smaller conical teeth anteriorly that are canted backwards, except 2 teeth on each side of premaxillary symphysis, which are as large or larger than adjacent outer teeth. Dentary with an outer row of moderate teeth, largest mid-laterally, and 1 or 2 irregular inner rows of smaller conical teeth anteriorly that are slightly canted backwards. Vomerine teeth absent.

Measurements of the 61.5 mm SL male holotype, as percent of SL: predorsal length 31.5; preanal length 58.4; dorsal-fin base 64.6; anal-fin base 35.9; pelvic-fin length 16.7; caudal-fin length 24.2; depth at anal-fin origin 18.1; caudal-peduncle depth 11.2; head length 35.3; postorbital-head length 24.0; upper-jaw length 27.8; postorbital-jaw length 18.7; orbit diameter 8.6. As percent of head length: postorbital-head length 68.0; upper-jaw length 78.8; postorbital-jaw length 53.0; orbit diameter 24.2.

Color pattern in alcohol (Fig. 1): head and body various shades of brown; head mostly uniformly pigmented except a few scattered dark spots, much smaller than pupil diameter; lips without bands and inside of mouth pale except inner lining of upper jaw and adjacent membranes with posterior dark stripe that is externally visible; body with irregular, mid-lateral, dark stripe that extends on to base of caudal fin, stripe bordered above and below by series of 6–8 faint pale spots that do not extend on to fin bases, upper spots smaller and more complete; dorsal fin with large ocellus centered between spines 3–6 followed by a similar sized, indistinct dark blotch extending to distal margin of fin, and soft portion of fin unmarked except for dark stripe, approximately width of pupil, centered on about basal third of fin; anal fin with narrow pale basal area, otherwise uniformly dark; caudal fin mostly pale with faint band on anterior third of fin; pelvic fin uniformly dark. Life coloration unknown.

**TABLE 1.** Fin-ray and caudal vertebral counts in the *Opistognathus solorensis* species group.

	Dorsal-fin spines and rays				Anal-fin spines and rays				Caudal vertebrae													
Species	X	XI	14	15	III	13	14	15	17	18	19											
<i>ensiferus</i>		1	1		1		1			1												
<i>solorensis</i>	2	83	80	5	85		83	2	2	81	2											
<i>verecundus</i>	2	27	26	3	29	1	27	1		28	1											
					Caudal-fin rays																	
					Procurent rays				Branched rays													
Total pectoral-fin rays					Upper			Lower			Total											
Species	34	35	36	37	38	39	40	4	5	6	3	4	5	7	8	9	10	11	12	13	14	
<i>ensiferus</i>							1		1			1			1						1	
<i>solorensis</i>	1	—	5	2	43	7	9	14	55	3	1	45	26		14	33	22	3		13	7	35
<i>verecundus</i>			15	6	8			15	9			4	19	1	3	13	7	1		4	6	12

**TABLE 2.** Gill-raker counts in the *Opistognathus solorensis* species group. Bilateral counts are given for *O. ensiferus*.

Species	Upper gill-rakers						Lower gill-rakers					
	8	9	10	11	12	13	15	16	17	18	19	20
<i>ensiferus</i>		1	1							1	1	
<i>solorensis</i>			15	28	27	3	1		2	29	33	10
<i>verecundus</i>		11	13					10	13	1		

continued.

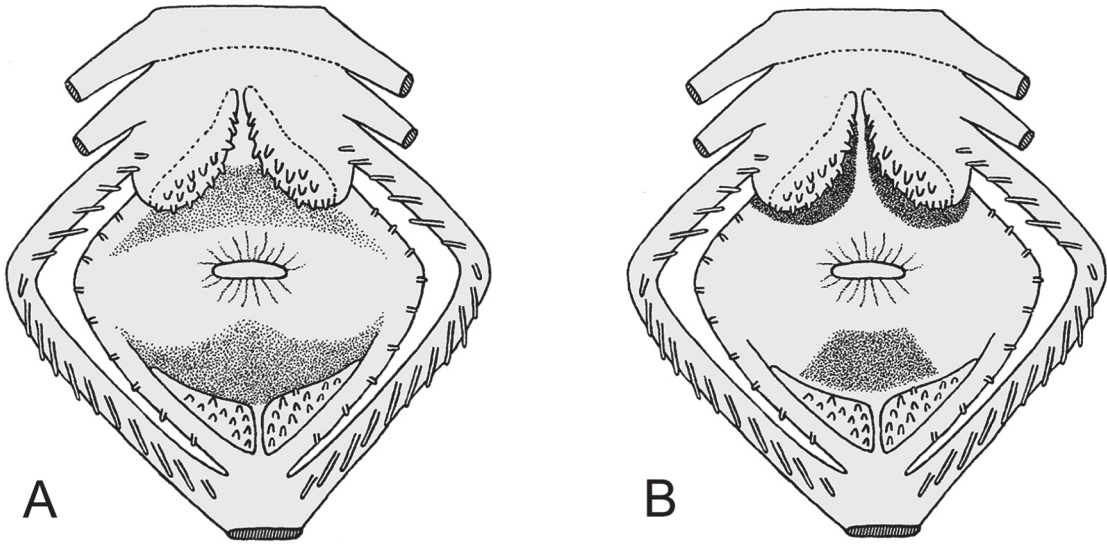
Species	Total gill-rakers											mean
	23	24	25	26	27	28	29	30	31	32	33	
<i>ensiferus</i>					1	—	1					28.0
<i>solorensis</i>					9	18	24	16	5	1	1	29.0
<i>verecundus</i>	5	11	7	1								24.2

**TABLE 3.** Oblique scale rows in horizontal series in the *Opistognathus solorensis* species group. Bilateral counts are given for *O. ensiferus*.

	44	46	48	50	52	54	56	58	60	62	64	66	68		
Species	45	47	49	51	53	55	57	59	61	63	65	67	69	mean	SD
<i>ensiferus</i>			1	—	1									50.0	2.8
<i>solorensis</i>					1	—	—	3	5	15	14	5	2	63.0	2.8
<i>verecundus</i>	2	—	3	3	3	1								49.4	3.1

**TABLE 4.** Lateral-line terminus position in relation to dorsal-fin segmented rays in the *Opistognathus solorensis* species group. When terminus ended between two rays the higher number was tabulated. Bilateral counts are given for *O. ensiferus*.

Species	Lateral-line terminus position							mean
	1	2	3	4	5	6	7	
<i>ensiferus</i>						1	1	6.5
<i>solorensis</i>	10	30	24	11				2.5
<i>verecundus</i>		3	17	7				3.1



**FIGURE 3.** Diagrammatic illustrations of oral pigmentation in two species of *Opistognathus*: A, *O. solorensis* and B, *O. verecundus*.

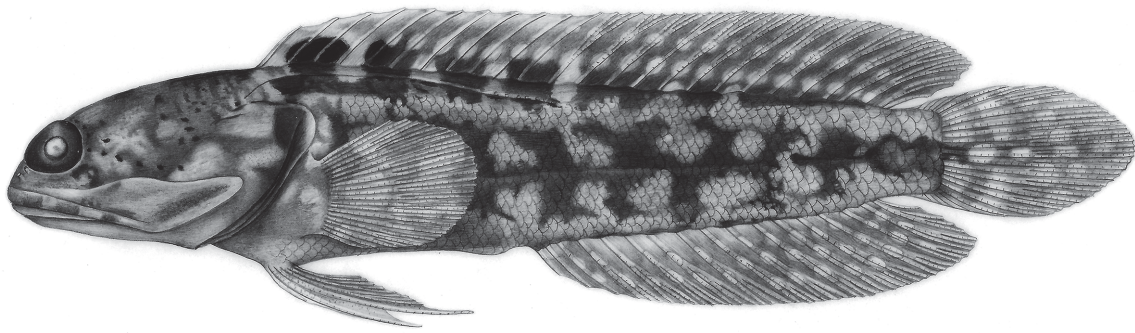
**Remarks.** The new species is most similar to *Opistognathus solorensis* and *O. verecundus* but differs from both species in having a lateral line that ends below the 6th or 7th segmented dorsal-fin ray (vs. below the 1st to 4th ray), inner lining of upper jaw and adjacent membranes with a single dark stripe (vs. two stripes) and no dark oral pigmentation (vs. with distinct oral pigmentation, Fig. 3). *Opistognathus verecundus* further differs in lacking a black blotch or spot on the spinous dorsal fin and in having fewer total gill rakers 23–26 (vs. 27–33).

**Distribution.** Known only from the type locality, Manauli Reef, Gulf of Mannar, India (Fig. 4).

**Etymology.** The specific epithet, from the Latin *ensifer* (sword-bearing), is in allusion to the scimitar-shaped upper jaw.







**FIGURE 5.** *Opistognathus solorensis*, USNM 210949, male, 72.9 mm SL, Nusa Laut Island, Molucca Islands. Drawn by Jack R. Schroeder.



**FIGURE 6.** *Opistognathus solorensis*, WAM P.33753-001, male 57.3 mm SL, Timor Leste. Photograph by Sandra J. Raredon.



**FIGURE 7.** *Opistognathus solorensis*, WAM P.33753-001, female 54.5 mm SL, Timor Leste. Photograph by Sandra J. Raredon.





**FIGURE 8.** *Opistognathus solorensis*, Lembah Strait, Sulawesi. Photograph by Ned DeLoach.

Scales absent on head, nape, area above lateral line, pectoral-fin base and breast; belly squamation varying from completely scaly or anterior 1/4 naked. Body oblique scale rows about 58–69 (except 53 in single specimen from Guimaras Island, Philippines). Lateral line ends below verticals between 1st to 4th segmented dorsal-fin rays. Lateral line pores numerous, arranged in multiple series above and below embedded lateral-line tubes. Cephalic sensory pores numerous (Fig. 2B), completely covering most of head, including all of predorsal area except a small area immediately adjacent to dorsal-fin origin; mandibular pore positions 1–2 with relatively large, single pores, 3rd position with 1 or 2 pores, 4th with 2–4 pores, and 5th with 2–12 pores. Pores more numerous in larger specimens.

Anterior nostril about mid-way between posterior nostril and dorsal margin of upper lip, consisting of a short tube with posterior rim longer than when depressed does not reach or just reaches margin of posterior nostril; height of tube shorter than to about equal maximum of diameter of posterior nostril. Dorsal fin moderately low anteriorly, with profile relatively uniform without any change in fin height at junction of spinous and segmented rays. Dorsal-fin spines relatively slender and slightly curved distally, with flexible tips; all segmented dorsal- and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. Posterior margin of preopercle indistinct without a free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 $\beta$  branch of adductor mandibulae.

Upper jaw sexually dimorphic (longer in adult males) and extending 1.1 to 2.4 eye diameters behind posterior margin of orbit; maxilla widest before end and scimitar-shaped, with flexible lamina posteriorly; supramaxilla moderately large, elongate and subterminally positioned. Jaws subequal, lower slightly included. Premaxilla with an outer row of moderately large, sharply pointed, conical teeth, those near posterior end of jaw noticeably smaller and more closely spaced; 2 or 3 irregular inner rows of much smaller conical teeth anteriorly, several slightly enlarged adjacent to premaxillary symphysis. Dentary with an outer row of conical teeth, those on posterior half of dentary largest and slightly hooked inward; anterior teeth blunter and with 2 or 3 inner rows of slightly smaller, conical teeth, those on innermost row canted backwards. Vomerine teeth absent. Infraorbital bones tubular with wide openings for sensory canals, 3rd infraorbital relatively robust with moderate suborbital shelf.

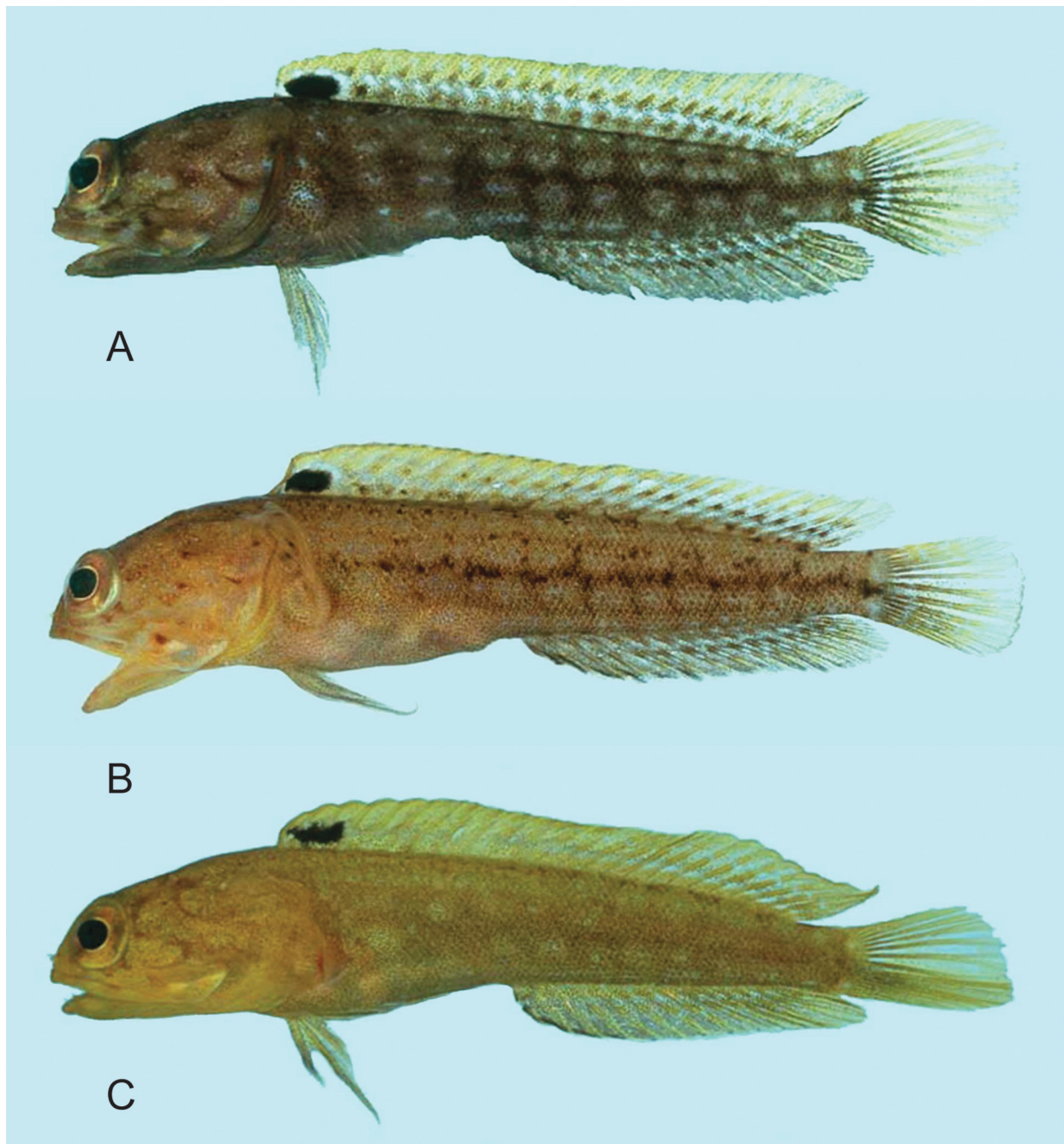
The following measurements are based on 15 males, 34.3–74.5 mm SL, and 15 females (in parentheses), 36.2–61.2 SL, as percent of SL: predorsal length 27.8–32.0 (28.5–34.2); preanal length 49.8–55.2 (52.3–62.7); dorsal-fin base 66.2–72.5 (66.0–77.4); anal-fin base 37.1–41.0 (33.8–40.3); pelvic fin length 20.0–25.2 (18.8–26.7); caudal fin length 19.2–22.4 (19.0–24.8); depth at anal-fin origin 15.0–18.5 (15.2–19.2); head length 29.4–34.5 (31.2–38.7); postorbital-head length 19.9–23.8 (19.7–27.0); upper jaw length 21.1–29.4 (20.9–25.5); postorbital-jaw length 11.2–19.1 (9.4–15.2); orbit diameter 7.4–10.2 (8.2–9.8). As percent of head length: postorbital-head length 60.7–79.0 (60.9–69.9); upper jaw length 67.3–90.5 (64.1–70.3); postorbital-jaw length 36.7–60.0 (28.7–40.6); orbit diameter 23.1–30.9 (23.3–30.0).

Color pattern in alcohol (Figs. 5–7): Complex pattern of brown stripes and bands, and white spots or blotches; dorsal fin with series brown and white spots arranged in rows, and with one or two pale edged black spots anteriorly, the first between spines 1–4 or 2–5; dorsal and anal fins with series of small brown and white spots;

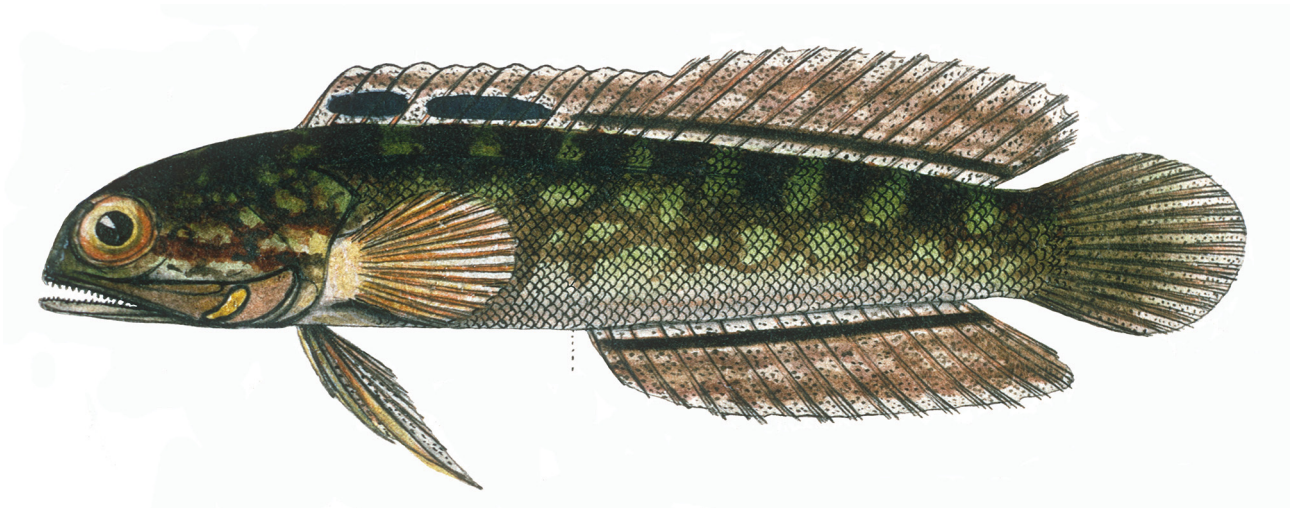


dorsal fin usually with a series of 6–8 dark basal blotches and anal fin with a submarginal narrow dark stripe. Inner lining of upper jaw and adjacent membranes with two black stripes; area above and below esophageal opening darkly pigmented and continuous between innermost pair of upper pharyngeal tooth plates.

In life, color pattern as in preserved specimens, except pale inner areas of maxilla yellow. Occasional specimens almost entirely yellow (Figs. 8–9); *Opistognathus variabilis* is the only other species that is known to rarely have a yellow morph. Bleeker's original color drawing of *Opistognathus solorensis* (Fig. 10) agrees reasonably well with the above description of typical specimens. Bleeker reported the number of blackish blotches in the spinous dorsal fin as 1–3. None of the specimens listed below have more than two blotches in the spinous dorsal fin, suggesting that Bleeker's count of three was erroneous. There is usually only a single blotch in the spinous dorsal fin but specimens from the Molucca Islands and Great Toba Island, Sulawesi, have two dark blotches, the first between spines 2–4 or 2–5 and another slightly smaller blotch centered on the next posterior spine.



**FIGURE 9.** *Opistognathus solorensis*, showing variation in coloration, ROM 77505, Ngeruketabel Island, Palau: (A) 31.9 mm SL, male, (B) 48.8 mm SL, female, (C) 42.2 mm female. Photographs by R. Winterbottom.



**FIGURE 10.** *Opistognathus solorensis* Bleeker original illustration (after Bleeker, 1983, pl. 421, fig. 1).

**Distribution.** Indo-West Pacific. Known from Taiwan, Brunei, Philippines, Indonesia, Timor Leste, Papua New Guinea and Palau (Fig. 4), in 0.5–30 m.

**Etymology.** Named for the type locality, Solor, a small island off the southeast end of Flores Island (8°45'S, 123°30'E), Indonesia.

**Type material.** No specimens are available from the Lawajong (= Solor) type locality, and the eight specimens subsequently cited by Bleeker (1874:472), including the holotype, are not extant. In the 1879 auction catalogue of Bleeker's collections (see Hubrecht, 1973:16), *O. solorensis* (Groupe III, no. 129) is marked with an asterisk indicating that these specimens were then in a bad state of preservation. According to M.J.P. van Oijen (in litt., 10 Jan. 1991), current curator of fishes at the RMNH in Leiden, neither he or former curator M. Boeseman were able to locate any Bleeker specimens of *O. solorensis*. A copy of the catalogue of Dr. C.M.L. Popta (curator from 1898–1928) includes a notation that the specimens were lost. In order to stabilize the nomenclatural application of the name *Opistognathus solorensis* Bleeker, I herein designate as the neotype RMNH 31660 (formerly USNM 210929), 62.3 mm SL, male, Indonesia, Banda Sea, Saparua, tidepool at Kulur (Kolor), V.G. Springer, 20 January 1973.

**Other material examined.** 102 specimens, 14–74.5 mm SL. **Taiwan:** SAIAB 27653 (1, 64), W. coast of Kenting National Park, off Wanlitong, 10–12 m. **Brunei:** WAM P.33117–001 (4, 24–48), Brunei Patches, 5°0.69'N, 114°42.147'E, 12 m; WAM P.33035–002 (4, 31–47), Abana Rock, 5°06'N, 115°04'E, 12–14 m. **Philippines:** BPBM 26559 (1, 47), Luzon, Batanagas, Caban Island, 13°40'45"N, 120°50'30"E 30 m; USNM 339205 (1, 43), Luzon, Pangasinan Prov., off Bolinao, Balingasay Reef, 16°20'N, 119°52'E, 12–33.5 m; USNM 339208 (2, 42–47), same locality as preceding, 21–24m; FMNH 118282 (1, 33), Palawan Prov., Tara Island, off NE coast of Busuanga, 12°18.90'N, 120°20.92'E, 22–25 m; USNM 396244 (16, 14–45), Palawan Prov., NW coast of Busuanga, near Illultuk Bay, off W side Elet Island, 12°15.16'N, 119°51.01'E; USNM 339206, (1, 45), Panay, Iloilo Prov., Sicogon Is., 11°25'20"N, 123°14'45"E, 12–14.5 m; FMNH 118285 (11, 24–41), Palawan Prov., off western Busuanga, West Nalaut Islad, 12°2.7'N, 119°47.58'E, 10–15 m; FMNH 118284 (4, 27–41), Palawan Prov., SW of Saddle Rock off SW Culion Island, 11°45.95'N, 119°53.22'E, 15–35 m; FMNH 118283 (1, 36), Palawan Prov., Culion Island, 11°40.55'N, 119°58.48'E, 24–26 m; USNM 396238 (2, 36–45), Palawan Prov., SE tip of Galoc Island, 11°56.33'N, 119°49.78'E, 10–20 m; WAM P. 32884–005 (1, 36), Palawan Prov., Bacuit Bay, Pangulasian Island, 11°7.036'N, 119°19.86'E, 18 m; USNM 339207 (1, 39), Guimaras Island, 10°28'25"N, 122°28'E, 14–20 m; ANSP 142960 (20, 25–51.5), Palawan Prov., Bararin Isand (Cuyo Is.), 10°52'42"N, 120°56'44"E, 0–17 m. **Indonesia:** WAM P.31558–004 (1, 65), Raja Ampat Is., Kri Island, 0°33'S, 130°41'E, 0.5 m; USNM 122419 (1, 43), Sulawesi, Great Tobea Is., 4°33'S, 122°42'E, tide pool; AMS I.18469–086 (1, 68), Banda Sea, Ceram, Marsegoe Bay; USNM 210929 (8, 35–74.5), Saparua Island, Kulur; USNM 216404 (1, 60), Great Banda Island; USNM 210949, (1, 73), Nusa Laut Island, 3°40'S, 128°47'E; USNM 220948 (2, 57–61), presumably Banda Sea (several specimens of blenniids from this lot are referable to W. H. Longley notes made on Banda specimens); WAM P.33896–001 (1, 20), Komodo Is., Rinca I., 8°37.693'S, 119°42.499'E, 14–15 m. **Timor Leste:** WAM P.33753–001 (10, 40.9–67.6), Timor Leste,

Manatuto, 8°30.826'S, 126°4.157'E, 0.3–1.0 m. **Papua new Guinea:** WAM P.30623–006 (1, 53.5), Madang, 5°9'S, 145°50'E. **Palau:** ROM 77505 (5, 32–49), Ngeruketabel Island, 7°15'52"N, 134°28'17.3"E, 24–26.5 m.

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